GRAPHING LOGARITHMIC FUNCTIONS You can use the inverse relationship between exponential and logarithmic functions to graph logarithmic functions.
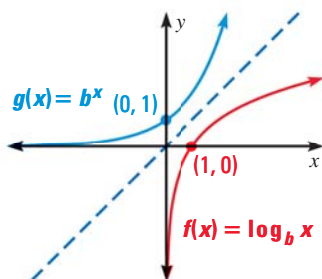

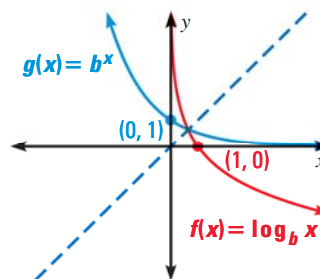**KEY CONCEPT**   *For Your Notebook*

Parent Graphs for Logarithmic Functions

The graph of $f(x) = \log_b x$ is shown below for $b > 1$ and for $0 < b < 1$. Because $f(x) = \log_b x$ and $g(x) = b^x$ are inverse functions, the graph of $f(x) = \log_b x$ is the reflection of the graph of $g(x) = b^x$ in the line $y = x$.

Graph of $f(x) = \log_b x$ for $b > 1$ **Graph of $f(x) = \log_b x$ for $0 < b < 1$**

Note that the y-axis is a vertical asymptote of the graph of $f(x) = \log_b x$. The domain of $f(x) = \log_b x$ is $x > 0$, and the range is all real numbers.

EXAMPLE 7   **Graph logarithmic functions**

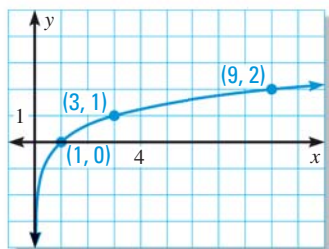**Graph the function.**

**a.** $y = \log_3 x$ **b.** $y = \log_{1/2} x$

Solution

a. Plot several convenient points, such as (1, 0), (3, 1), and (9, 2). The y-axis is a vertical asymptote.

From *left* to *right*, draw a curve that starts just to the right of the y-axis and moves up through the plotted points, as shown below.

b. Plot several convenient points, such as (1, 0), (2, −1), (4, −2), and (8, −3). The y-axis is a vertical asymptote.

From *left* to *right*, draw a curve that starts just to the right of the y-axis and moves down through the plotted points, as shown below.
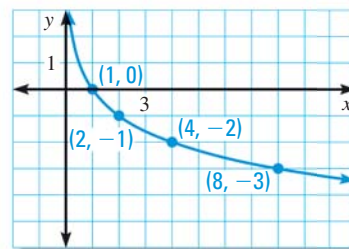
Animated **Algebra**   at classzone.com